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Correlation between Diabetic Retinopathy and glycemic control in patients in a south Indian hospital

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Abstract
Aims*: To asess the association between glycemic control and Diabetic Retinopathy [DR] in patients attending a diabetic clinic.*
Methods*: In this study 750 diabetic patients who reported for executive check up in a preventive clinic were evaluated for DR. Retinopathy was graded as Non proliferative DR [NPDR] and Proliferative DR [PDR].Risk factors for DR like glycemic control, duration of diabetes and treatment details were evaluated. Investigations included complete blood count, blood sugar, serum lipids, ECG, Renal function tests and complete clinical examination.We have given more importance to the relation of DR and glycemic control in this article.*
Results*: DR was detected in 111 patients(14.8%) with NPDR in 106 patients (14.1%) and PDR in5 patients (0.7%).The incidence of DR was more in patients with poor control of diabetes 76(17.6%) compared to 23(11.9%) in patients with moderate control and 12(9.7%)in patients with normal blood sugar. Retinopathy was more prevalent in patients with Insulin requiring diabetes 39(52.6%) compared to patients not requiring insulin 72(11.8%).*
Conclusion*: The degree of glycemic control is a major modifiable risk factor for development of DR. Retinopathy is more prevalent in patients with insulin requiring diabetes compared to patients not requiring insulin.*
Keywords: *Diabetic Retinopathy, Fasting blood sugar, Glycemic control*

I. Introduction

DR is the most important microvascular complication of diabetes [1].It is the leading cause of blindness in middle aged adults [2]. According to WHO 70 million people were affected by diabetes in India in the year 2015 and the figure is estimated to rise to 79.4 million by 2030[3]. It is estimated that the global magnitude of DR will increase from 126.6 million in 2010 to 191 million by 2030[4] .Good glycemic control was found to be associated with decreased development and progression of DR. Achieving good glycemic control reduces the risk of micro and over the long term ,macrovascular complications in both type 1 and type 2 diabetic patients [5].

II. Patients And Methods

750 diabetic patients who reported for executive check up over a period of 2 years were examined in ophthalmology department of SUT hospital for the presence or absence of DR.A full medical history was taken including age of patient, duration of diabetes and treatment details .Fasting blood sugar of each patient was estimated after an overnight fast. Diabetic control was graded as normal(<100 mg/dl),moderate control(100-126 mg/dl) and poor control(>126 mg/dl). Glycosylated Hb assay is a good marker of long term glycemic control [6].It was not done in all cases and hence not included in this study. Treatment details were graded as those patients on oral hypoglycemic agents or insulin or both. Post prandial blood sugar(PPBS) was not taken into consideration because of variation of food and interval between food and PPBS.

The pupil of each eye was dilated using Tropicamide 1% and phenylephrine 10% eye drops followed by detailed fundus examination with direct and indirect ophthalmoscopy. DR patients were classified according to the grading in the worse eye.

III. Statistical Analysis

Quantitative variables expressed in mean+/- standard deviation(SD) and categorical variables expressed in percentage. Association of Retinopathy with selected variables was carried out using chi square test. SPSS 17.0 version was used for analysis. P values less than 0.05 was considered statistically significant.

IV. Results

In this study, of the 750 diabetic patients, 567(75.6%)were males and 183(24.4%)were females. The mean age of those examined was +/- SD 53.9+/-9.1.(TABLE 1).

Table 1: Percentage distribution of the sample according to age

Age	Count	Percent
31 - 40	50	6.7
41 - 50	219	29.2
51 - 60	295	39.3
61 - 70	158	21.1
71 - 80	28	3.7
Mean ± SD	53.9 ± 9.1	

DR was detected in 111(14.8%) patients. Of this NPDR was present in 106(14.1%) and PDR in 5(0.7%) (TABLE 2).

Table 2: Percentage distribution of the sample according to associated retinopathy

Associated retinopathy	Count	Percent
Normal	639	85.2
NPDR	106	14.1
PDR	5	0.7

The incidence of DR was high in those with high fasting blood sugar. The association was significant 23(11.9%) in patients with moderate control and 76(17.6%) in patients with poor control, with p value significant at 0.05 level (TABLE 3) (Fig 1).

Table 3: Comparison Of FBS Based On Retinopathy

FBS	Retinopathy				χ^2	p
	Normal		Abnormal			
	Count	Percent	Count	Percent		
Normal	112	90.3	12	9.7	6.59*	0.037
Moderate control	171	88.1	23	11.9		
Poor control	356	82.4	76	17.6		

*: - Significant at 0.05 level

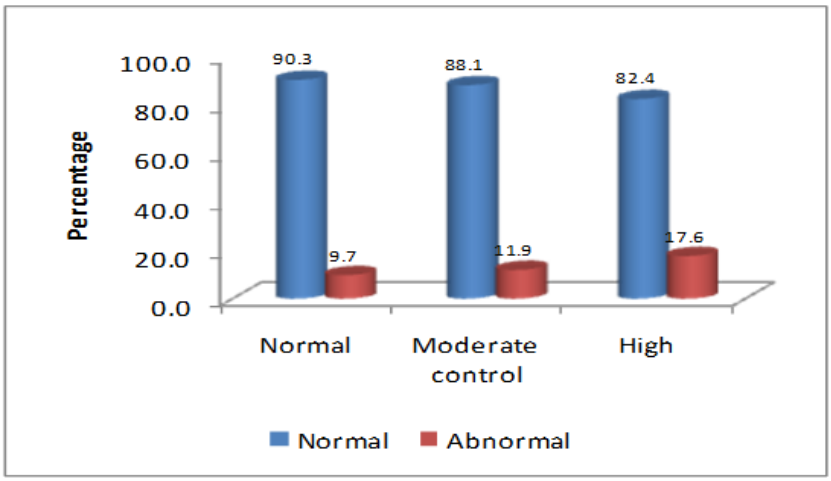

fig.1 comparison of FBS based on retinopathy

Overall retinopathy was more prevalent in patients with insulin requiring diabetes 39 (52.6%) compared to patients not requiring insulin 72 (11.8 %).The association was significant with p value at 0.01 level (TABLE 4) (Fig 2).

Table 4: Comparison of treatment based on retinopathy

Treatment	Retinopathy				χ^2	p
	Normal		Abnormal			
	Count	Percent	Count	Percent		
OHA	536	88.2	72	11.8	23.15**	<0.001
Insulin only	33	76.7	10	23.3		
OHA+Insulin	70	70.7	29	29.3		

**: - Significant at 0.01 level

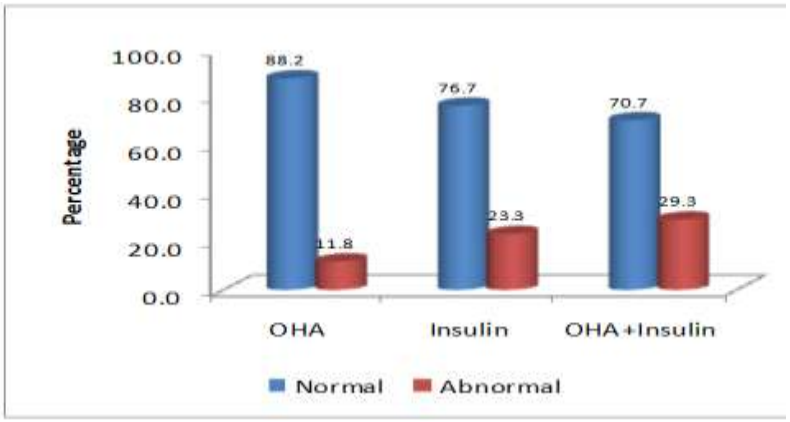

fig.2: comparison of treatment based on retinopathy

The highest risk for development of DR was in those patients having diabetes for > 10 years. There was significant association between duration of diabetes and DR in this study. (TABLE 5) (Fig 3).

Table 5: Comparison of retinopathy based on duration

Duration	Retinopathy				χ^2	p
	Normal		Abnormal			
	Count	Percent	Count	Percent		
0 - 5	288	94.7	16	5.3	55.27**	p<0.01
6 - 10	174	84.1	33	15.9		
11 - 15	85	78.0	24	22.0		
16 - 20	55	64.7	30	35.3		
>20	37	82.2	8	17.8		

**: - Significant at 0.01 level

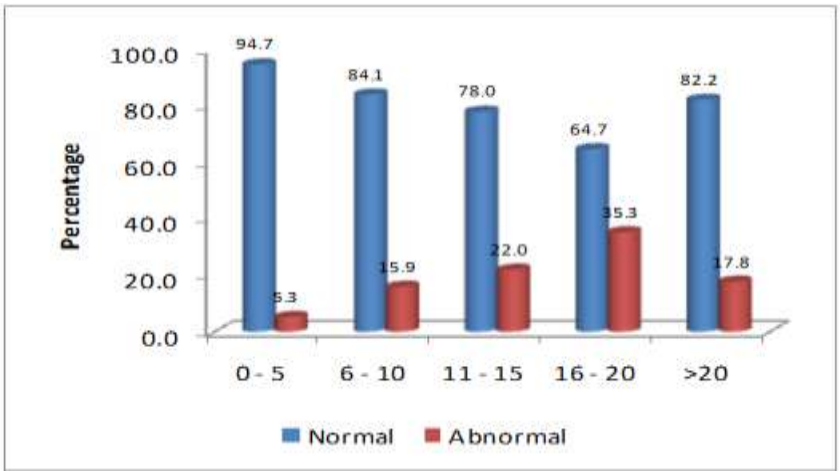

fig.3: comparison of retinopathy based on duration

V. Discussion

The duration of diabetes and glycemic control are the 2 most important factors in the development of retinopathy. The importance of metabolic control in prevention of diabetic complications has been clearly shown by the Diabetes Control and Complications study(DCCT) and the United Kingdom Prospective Diabetes Study(UKPDS).However in both these studies there were patients who developed retinopathy despite

fairly good control of diabetes and others protected from retinopathy despite poor control of diabetes. This raises the possibility of a genetic predisposition to retinopathy [7]. .UKPDS demonstrated that intensive diabetic control slowed the progression of DR and the continued beneficial effects were observed 10 years after the clinical trial [8].

The mechanisms underlying hyperglycemia induced microvascular events in the retina are not clear. One study implicated the overproduction of free oxygen radicals .Another reported that hyperglycemia caused microvascular stress [1].Hyperperfusion which is worse in those with poor diabetic control is an important factor in the evolution of DR. High glucose damages the pericytes which also contribute to evolution of retinopathy[9].

In this study the degree of glycemic control proved to be a significant factor in the development of retinopathy in the diabetic patients (p value 0.037)consistent with other studies. Our study does not represent the true long-term glycemic control as it was cross-sectional rather than longitudinal using a single Fasting blood sugar value recorded. Nevertheless ,the findings agree with previous population based and longitudinal studies showing that glucose control has an important and persistent effect in reducing microvascular complications. [10].Aggressive glycemic control in type 2 diabetes is associated with a 25% lower incidence of microvascular complication[11].

In this study retinopathy was more prevalent in insulin requiring diabetics compared to insulin non users.(p value significant at 0.01 level).In subjects with Type 2 Diabetes having sub optimal glycemic control ,starting insulin early may be more beneficial in preventing the development of retinopathy[12].

The association of duration of diabetes and retinopathy has been proved in a number of studies. In our study the incidence of retinopathy showed a steady increase after 6 years {15.9 % to 35.3 %) and a reduction after 20 years to 17.8 %.It is probable that both genetic and environmental factors play a role in the expression of DR [7,13,14].

VI. Conclusion

Good glycemic control and duration of diabetes are the 2 most important factors in the development of retinopathy. Intensive diabetic control conferred enduring protection from progression of retinopathy. DR is more prevalent in patients with insulin requiring diabetes compared to patients not requiring insulin.

Caring for diabetic patients should include screening for risk factors associated with retinopathy and controlling them to prevent and delay progression of retinopathy.

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